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EXAMINER	
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AMANDA BAER, MARIE-CLAIRE CYRILLE, FREDERICK HAYES DILL, BENJAMIN LU CHEN WANG, CHARNGYE HWANG, and MUSTAFA PINARBASI

Appeal 2009-013936
Application 10/675,697
Technology Center 1700

Decided: May 6, 2010

Before MICHAEL P. COLAIANNI, CATHERINE Q. TIMM, and JEFFREY T. SMITH, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision to reject claims 1, 2, 4, 6, 8-16, 18, and 21-30. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

Appellants' invention relates to a method of making a read sensor for a magnetic head, including a first, two-step process for defining a stripe height and a second process for defining a trackwidth, in which both the first and second processes include removing a photoresist layer by chemical-mechanical polishing (CMP) (Spec. 1:7-13). Claim 1 is illustrative:

> 1. A method for use in forming a read sensor for a magnetic head, comprising:
>
> forming a chemical-mechanical polishing (CMP) protective layer over a plurality of read sensor layers;
>
> forming a first photoresist structure in a central region over the read sensor layers;
>
> performing a reactive ion etching (RIE) to remove end portions of the CMP protective layer in end regions which surround the central region without removing any of the read sensor layers, to thereby leave intact both a central protective portion of the CMP protective layer underneath the first photoresist structure and the read sensor layers;
>
> after performing the RIE and leaving the read sensor layers intact, performing an ion milling of the read sensor layers such that end portions of the read sensor layers are removed in the end regions and a central sensor portion remains underneath the first photoresist structure, to thereby define a stripe height for the read sensor;
>
> forming an insulator layer around the read sensor where the end portions were removed;
>
> removing the first photoresist structure through mechanical interaction with a CMP pad by compressing the first photoresist structure with the CMP pad until it reaches a top surface of the CMP protective layer, which provides a

suitable physical barrier to protect the read sensor layers from the CMP pad;

forming a second photoresist structure in a central region over the read sensor layers; and

etching the read sensor layers such that the end portions of the read sensor layers are removed and a central portion remains underneath the second photoresist structure, to thereby define a trackwidth for the read sensor.

The Examiner relies upon the following evidence:

First Named Inventor	*Document No.*	*Issue or Pub. Date*
Sasaki	US 6,315,875 B1	Nov. 13, 2001
Konuma	US 2002/0030443 A1	Mar. 14, 2002
Lille	US 2004/0027730 A1	Feb. 12, 2004

The Examiner maintains, and Appellants seek review of, the following rejections:[1]

1. The rejection of claims 1, 2, 4, 6, 8-16, 18, 23-26, and 28-30 under 35 U.S.C. § 103(a) as unpatentable over Sasaki in view of Lille;
2. The rejection of claims 21 and 27 under 35 U.S.C. § 103(a) as unpatentable over Sasaki in view of Lille and Konuma;
3. The rejection of claim 22 under 35 U.S.C. § 103(a) as unpatentable over Sasaki in view of Lille and Appellants' admitted prior art. [2]

[1] The Examiner couches the second two rejections as "not on review" or "not on appeal" (Ans. 2-3; Office Communications dated July 23, 2009 and August 10, 2009), but Appellants clearly state that they are appealing all the rejections (Br. 2 and 6). However, the Examiner's statement is harmless because the second two rejections are not argued separately.

[2] Appellants list claims 21 and 27 as rejected (Br. 6). Because Appellants do not argue the merits of this rejection, the error is harmless.

II. DISPOSITIVE ISSUE

Did the Examiner provide sufficient reasons why one of ordinary skill in the art would have removed a portion of a CMP protective layer provided over a plurality of read sensor layers by reactive ion etching without removing any of the read sensor layers, as recited in claim 1, based on the teachings of Sasaki and Lille? We answer this question in the affirmative.

III. FINDINGS OF FACT

1. Appellants' Specification states that a protective layer 202 is deposited over the read sensor layers 106 (Spec. 6:25-26; Fig. 4).
2. Sasaki teaches a GMR element 5 including a number of layers having certain magnetic properties in the following order from the top down: 5c, 5f, 5b, 5e, and 5a. The structure also includes a base layer of tantalum 5d disposed below the layers with magnetic properties and a protective layer of tantalum 5g disposed above the layer with magnetic properties. Sasaki does not disclose the purpose of the upper tantalum layer 5g other than that it is a "protective layer." (Sasaki, col. 11, ll. 49-62.)
3. Sasaki teaches using a reactive ion etch to etch "some of the layers making up the GMR element 5, that is, a part of the thickness of the layers from the top surface" (Sasaki, col. 12, ll. 14-17).
4. Sasaki includes an example in which "this etching is performed at least as deep as the free layer 5c," an example in which only layer 5a and base layer 5d are left unremoved, and an example in which layers 5b and the layers below it are left unremoved (Sasaki, col. 12, ll. 17-18, 24-27, and 35-37).

5. Sasaki teaches that "[t]he second etching step is performed to etch only some of the layers making up the GMR element 5, instead of etching all the layers. Therefore, the time required for performing the second etching is short. As a result, very little damage is done to the first shield gap film 4*a* even through [sic, though] ion milling is performed as the second etch" (Sasaki, col. 12, ll. 49-54).
6. Lille teaches that sensor layer 904 may be capped with a RIEable protective barrier layer 908 of tantalum, carbon or diamond-like carbon (DLC) (Lille, ¶¶ [0043]-[0044]).
7. Lille teaches that a photoresist mask is preferably removed through a chemical-mechanical polishing (CMP) process because the layers that cover the resist mask make it difficult to remove (Lille, ¶ [0053]).
8. Lille teaches that, if the photoresist mask is to be removed by a CMP process, a CMP resistant layer, such as carbon or DLC, will prevent mechanical dishing into the sensor when the resist is removed (Lille, ¶ [0053]).

IV. PRINCIPLES OF LAW

During examination, "claims . . . are to be given their broadest reasonable interpretation consistent with the specification, and . . . claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art." *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) (*quoting In re Bond,* 910 F.2d 831, 833 (Fed. Cir. 1990)).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."

KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 416 (2007). The question to be asked is "whether the improvement is more than the predictable use of prior art elements according to their established functions." *KSR,* 550 U.S. at 417. Moreover, one of the ways in which a claim's subject matter can be proved obvious is by establishing that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the claims. *KSR*, 550 U.S. at 419-420.

V. ANALYSIS

The Examiner's rejection indicates that it would have been obvious to one of ordinary skill in the art to make three modifications to the teachings of Sasaki to arrive at the claimed invention. First, it would have been obvious for the RIE to be performed so as to remove the end portions of the protective layer without removing any of the underlying read sensor layers "to better accomplish the goal disclosed by Sasaki of exploiting the differences between the RIE and the ion milling to ensure that the layers underneath the read sensor layers are not damaged when the read sensor layers are removed" (Ans. 4-5). Second, it would have been obvious to use the CMP method taught by Lille to remove the photoresist since Lille teaches that "CMP can successfully remove the resist even when other materials have been deposited on it, without damaging the read sensor layers" (Ans. 5). Third, it would have been obvious to modify the protective layer taught by Sasaki to form it of a CMP protective material since Lille teaches that a CMP protective layer helps "prevent mechanical dishing into the read sensor when the resist is removed by CMP" (Ans. 6). We find the

reasoning of the Examiner to be reasonable and well supported by the teachings of the references (FF 2-8).

Appellants contend that the tantalum capping layer 5g taught by Sasaki is standard ubiquitous practice for a read sensor layer and would not be eliminated and replaced by a CMP protective layer, since the CMP layer would not provide equivalent protection to the tantalum capping layer and without the tantalum capping layer the underlying read sensor layers would be damaged or prone to damage (Br. 9-11). We disagree.

Appellants have put forth no evidence to support the assertion that the tantalum capping layer is necessary or that a structure with only a CMP protective layer and not a tantalum protective layer would have rendered the read sensor layer damaged or prone to damage. To the contrary, Lille would have suggested to one of ordinary skill in the art that carbon and diamond-like carbon (CMP resistant materials) and tantalum are known alterative RIEable protective layer materials for read sensors (FF 6).

Appellants also contend that Sasaki's teaching, which Appellants characterize as some of the read sensor layers must be removed to shorten the time required for ion milling the remaining layers to avoid over-etching and damaging the underlying insulating layer, is counter to the claimed invention in which reactive ion etching is performed without removing any of the read sensor layers (Br. 12-15). According to Appellants, some of these layers must include at least the top capping layer of tantalum (*id.*).

To the extent that Appellants are asserting that protective layer 5g, whether tantalum or a CMP resistant material, is part of the read sensor layer, the removal of which by reactive ion etching is particularly excluded

by claim 1, we disagree. We do not find it reasonable that the protective layer 5g constitutes a read sensor layer based on the broadest meaning of the term "read sensor layer" as described in Appellants' Specification. In particular, Appellants' Specification indicates that a protective layer is placed over the read sensor layers (FF 1) and, thus, is a separate layer from the layers which remain "intact" after the reactive ion etching step of claim 1. Therefore, despite the fact that protective layer 5g is described in Sasaki as part of GMR element 5, Sasaki does not describe protective layer 5g as a read sensor layer or as having any functions other than a protective function.

Sasaki broadly teaches removing "a portion where the layers make up the GMR element 5" (FF 2-3). The Examiner reasoned that even removing only the top protective layer 5g from the GMR element 5 of Sasaki would constitute removal of "some of the layers making up the GMR element 5" and would meet the goals taught by Sasaki of having the second etching step take a shorter amount of time (Ans. 22-23). We agree. Sasaki does not suggest the removal of any particular layers of the GMR element 5. To the contrary, Sasaki suggests various examples where reactive ion etching removes material so as to retain different layers of the GMR element 5 (FF 2-4). Sasaki does not require the removal of any of the layers with magnetic properties, which we would consider the read sensor layers. Thus, it is reasonable that one of ordinary skill in the art would have removed portions of the GMR element 5 taught by Sasaki only through protective layer 5g.

Moreover, it is apparent that the Examiner's rejection considers the obviousness of forming the protective layer 5g taught by Sasaki with the CMP protective material taught by Lille, rather than tantalum, and removing

only the CMP protective layer as taught by Lille (Ans. 6). Thus, Appellants' arguments are not directed toward the Examiner's stated rejection to the extent they are directed towards a modification in which both a tantalum layer 5g and a CMP protective layer are present and only the CMP protective layer is removed by reactive ion etching, leaving all the layers of the GMR element 5 to be etched by ion milling (*see* Br. 12-14).

VI. CONCLUSION

On the record before us and for the reasons discussed above,[3] we sustain the rejections maintained by the Examiner.

VII. DECISION

The decision of the Examiner is affirmed.

VIII. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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[3]Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants could have made but chose not to make have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2008).